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CONTROLS INTERNAL PARASITES OF SHEEP ON PASTURE
IN LONG-TIME TEST

Therapeutic Doses Are Also Effective in Controlling Internal Parasites of Other Animal Species

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PHENOTHIAZINE-SALT MIXTURE CONTROLS INTERNAL PARASITES OF SHEEP ON PASTURE IN LONG-TIME TEST

Twelve years of testing has proved that phenothiazine, when mixed with salt and fed continuously on a free-choice basis, is safe and effective in controlling internal parasites in sheep on pasture.

This finding is particularly helpful to owners of farm flocks, since internal parasites cause their most serious losses.

As early as 1939 research men found that internal parasites in sheep could be controlled with dosages of phenothiazine. It is particularly effective in checking infestations of stomach worms, hookworms, small intestinal hair-like worms known as trichostrongyles, intestinal wireworms, and nodular worms.

Dosages of phenothiazine kill most of the worms and eggs--but not all. Within a matter of a few weeks when the sheep are on pasture, the few remaining worms can multiply into infestations of serious proportions. Therefore, a safe, economical, and effective method is needed to prevent redevelopment of parasites in grazing sheep once the internal parasites are brought under control by medical doses.

Agricultural Research Service scientists began in 1942 to test the reactions of a flock of average sheep to a mixture of 1 part phenothiazine to 9 parts loose granular salt fed on a free-choice basis. The mixture has been kept before the flock continuously except for a brief period when it was purposely removed. This is the longest period animals have ever been exposed to the drug.

Since the free-choice treatment was started at the Agricultural Research Center in 1942, lamb crops have improved steadily in quality and in the number born alive. The parasitic infestation of the flock, which was originally quite severe, declined rapidly under treatment and has been held in check. The animals are nearly free from nodular worms. Stomach worms, hookworms, trichostrongylids, and nematodirids are sometimes found in very small numbers. Even some of the other types of parasites originally present in sheep have also disappeared. It has not yet been proved whether or not phenothiazine was responsible for eradicating them from the flock.

NO IMMUNITY DEVELOPS

After 5 years of continuous use, the phenothiazine-salt mixture was deliberately removed for about 5 1/2 months. During this period, parasite numbers multiplied rapidly and losses from parasitism began to occur. At the end of the period without treatment, losses were stopped by administering full therapeutic doses of phenothiazine (medical doses to treat existing disease or parasitism), followed by a return to the phenothiazine-salt mixture as a preventive. During the 6 1/2 years from that time to the present, parasites have again been controlled in the flock by this preventive method. It is evident from this research that sheep do not build up immunity to parasites as a result of the small infestations that persist despite the drug, nor do parasites seem to develop immunity to phenothiazine.

The chemical causes no ill effects upon breeding, fertility, lambing, lamb growth, wool production, and general condition of the flock. After sheep have consumed phenothiazine continuously, the wool becomes slightly rosy in color. Some sheep raisers have questioned this color change as a possible economic liability. However, tests have shown that after scouring it is very difficult to tell the wool of phenothiazine-treated sheep from that of non-treated sheep.

METHOD AND COST OF TREATMENT

Before the free-choice treatment is started, the sheep should be given therapeutic doses of phenothiazine to rid them as much as possible of any parasitic infestations. No further therapeutic treatment should be necessary except for heavily parasitized animals that might require repeated dosing. The phenothiazine-salt mixture should be put out the first day of the grazing season--before pastures become contaminated from droppings. It should be kept before the ewes and lambs at all times during the warm grazing season, generally from May to October and longer in the South. One part phenothiazine is mixed with 9 parts of loose granular salt. Commercial phenothiazine-salt mixtures of these proportions are available. Some sheep raisers prefer to give the drug in a mixed mineral supplement. Either mixture should be placed in a container where it is sheltered from the sun and weather, and where sheep have ready access to it. Containers should be located near the common water supply and preferably near any source of supplementary feeding. Enough of the mixture is put into the container to meet the salt requirements of the flock for 2 to 4 weeks.

Usually 30 sheep will consume in a month 10 pounds of medicated salt, containing 1 pound of phenothiazine. Less phenothiazine would not provide adequate protection against infestation with roundworms. At current retail prices of about 75¢ a pound for the phenothiazine powder, it would cost about 75¢ a month to maintain 30 sheep under this treatment.

GOOD BUT NOT PERFECT

The preventive treatment with phenothiazine-salt mixture is widely used in this country with remarkable success. It is simple, easy, and effective. However, it does not provide the full solution to the problem.

In the first place, no anthelmintic treatment for worm parasites should ever be expected to be a substitute for good management. Sound practices of breeding, feeding, and management must form the basis for prevention of losses from disease and parasites. Treatment is merely a helpful addition.

Secondly, the success of the use of treated salt on a free-choice basis as a preventive depends upon the natural desire of sheep for salt. Therefore, the treated mixture must be the only source of salt available to the flock. In areas of high soil or water salinity, or where natural salt is exposed, the treatment is not practical because it must be assumed that sheep would consume salt from natural sources and not get enough phenothiazine to protect them from parasites.

WINTER TREATMENT OF SHEEP

Another reliable system of preventive medication is the winter treatment of sheep with phenothiazine. It is used principally in northern climates and is based on individual dosing of breeder ewes in the winter between grazing seasons.

Most parasites do not survive a winter on idle pastures. They are perpetuated in breeder stock during the winter months and contaminate spring pastures in time to strike at young spring lambs. To combat this cycle, the winter treatment calls for a therapeutic dose of phenothiazine (25 to 30 grams, usually about one ounce per animal) immediately before the sheep are put onto pasture in the spring.

This program can be used only in areas with cold winter climate, while the free-choice method with treated salt can be used in any area that does not provide natural salt. Less of the drug is used in the winter treatment method, but more labor than in the phenothiazine-salt method.

THERAPEUTIC TREATMENT OF SHEEP

Therapeutic treatment with phenothiazine usually concerns the medication of an animal after it is heavily infested with parasites. The proverbial ounce of prevention is still greatly to be preferred over the pound of cure; but if parasites become established, therapeutic treatment is necessary.

Recommended individual dosage is about 1 ounce of phenothiazine for sheep and a little over half an ounce for lambs. It may be given in feed, in a drench, or in capsule. In drenching, 2 ounces of liquid containing about 40 to 50 percent phenothiazine is the usual dose for mature sheep. Several animals can be treated at the same time by mixing the drug with feed, making sure the medicated feed is consumed in a short period of time, usually within a day.

TREATMENT OF OTHER ANIMALS

No system has been fully developed for treating other species of animals with phenothiazine on a continuous free-choice basis, although a slightly modified procedure holds promise for goats and cattle. Therapeutic treatments of the species, however, have been highly effective.

GOATS respond about as well as sheep to therapeutic medication with phenothiazine, although slightly larger doses (35 to 40 grams for adults and 15 to 20 grams for kids) are generally indicated for large animals with heavy infestations of intestinal hairworms. As with sheep, the drug may be given in capsules, in feed, or in a drench. In dairy goats the milk from treated animals turns pink for 3 or 4 days following medication and should not be used for human consumption during this period. It is not harmful in any way, however, and may be fed freely to other animals. Rarely, young goats may be temporarily blinded if they are exposed to bright sunlight on the day after dosing while the drug is still in the system. (The same effect has been reported in swine and cattle.)

The continuous free-choice use of phenothiazine and salt mixtures, as described for sheep, has not been reliable for the control of gastro-intestinal parasites of goats. However, a slightly modified procedure has shown promise of effective action. In this method, the goats are given a mixture of 1 part phenothiazine to 7 parts salt one day each week, no salt being available to the animals the other 6 days. The method is not suitable for use in dairy goats in production.

The Department is continuing its investigations to find more effective preventive treatments.

CATTLE have been used in a number of experiments to develop a practical method of providing phenothiazine on a free-choice basis. Some preliminary trials have been successful. Others have not. Results of these investigations indicate that no specific program will apply generally to all herds. Variable factors, such as diet, apparently have a definite influence on the consumption of phenothiazine-salt mixtures. However, the most consistently effective results by this method have been achieved by mixing the chemical with feed, providing about 1/2 gram of phenothiazine for every 100 pounds of body weight up to a total of 2 to 5 grams per head daily for cattle over 500 pounds. In therapeutic treatment for the removal of stomach worms, intestinal hairworms, and nodular worms, phenothiazine is very effective in doses of 10 to 20 grams per 100 pounds of live weight, with a maximum dose of 60 grams, administered in feed, in capsules, or as a drench.

HORSES can be given small amounts of phenothiazine during the grazing season to control strongyles (internal worms of about 40 different species). The method of administering the drug was developed at the University of Kentucky after preliminary work at the U.S. Department of Agriculture's Research Center. The method consists of providing 2 grams of phenothiazine a day in the feed for the first 21 days of each month during the grazing season. This does not destroy all mature parasites, but it does stop production of their eggs and provides an excellent control of strongyles. Between grazing seasons--in the spring or in the fall--horses can be treated for these parasites also with therapeutic doses of 1 ounce of phenothiazine in capsules, in a drench or in feed. It is common practice to divide the total therapeutic dose into 6 or more parts, giving one part daily in the feed. Horses should always be treated individually by whatever method the drug is given. This treatment has been widely used on Thoroughbreds from 1 to 4 years old. In some cases, the drug has caused temporary anemia, jaundice, and in a few instances death. But unfavorable reactions seldom occur if the method of divided doses is used.

THE CHEMICAL ITSELF

Phenothiazine is a synthetic organic chemical prepared by combining a synthetic coal-tar product (diphenylamine) with sulphur. It was developed in Europe in 1885, but was first considered merely a chemical curiosity. Later, entomologists used it experimentally as an insecticide to destroy mosquito larvae and to control the codling moth. Veterinary scientists of the U.S. Department of Agriculture first investigated its action against internal parasites of livestock and, after extensive experiments, reported in December 1938 that phenothiazine showed promise as an anthelmintic for swine. In the next 3 years it was found to be very effective in salt mixtures as a preventive treatment for the control of gastro-intestinal parasites of sheep. This has proved to be among its most useful applications in the battle against parasites.

Because animals treated with phenothiazine generally grow faster than untreated animals, it was suggested recently that the chemical might be a growth stimulant. However, later tests have confirmed the original belief that the growth effect is a result of the thriftier condition of animals free of worms.

The perfect anthelmintic has been described as one that would have no injurious action whatsoever on the host and yet would kill all or practically all the parasites infesting an animal. No such drug has yet been discovered. However, phenothiazine appears to be the nearest approach to that ideal now available. Its amazing growth in popularity and in current widespread use attest to its value to stockmen. In 1939--the first year it was commercially available to stockmen--only 900 pounds were used in the United States. By 1944, consumption in this country had jumped to nearly 3,000,000 pounds. Today, its use has leveled off to a rate of nearly 5,000,000 pounds a year.

PHENOTHIAZINE AS AN ANTHELMINTIC

Species	Parasites controlled	Preventive treatment	Therapeutic dose
SHEEP	Hairworms, hookworms, nodular worms, stomach worms, wireworms.	Continuous exposure to 1 part phenothiazine mixed with 9 parts salt on free-choice basis during summer grazing season.	One ounce for sheep, half ounce for lambs.
CATTLE	Stomach worms, hairworms, nodular worms.	None fully developed. Good results from daily doses of 1/2 gram phenothiazine per 100 lbs. live weight up to 2 to 5 grams daily per animal. In some areas the treatment recommended for sheep has given good results.	10 to 20 grams per 100 lbs. live weight. Maximum dose 60 grams.
SWINE	Nodular worms.	None recommended.	12 grams phenothiazine per 100 lbs. live weight, by dose syringe, stomach tube, or capsule.
GOATS	Stomach worms, hairworms, nodular worms.	None fully developed. Some good results from "weekly salting" with 1 part phenothiazine and 7 parts salt, and with continuous free-choice administration of 1 part phenothiazine and 10 parts salt.	35 to 40 grams for adults; 15 to 20 grams for kids.
HORSES	Strongyles	None fully developed. Good control from 2 grams phenothiazine daily for the first 21 days each month throughout grazing season.	30 grams.